

A Revision of *Dyera* (Apocynaceae: Rauvolfioideae)

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Abstract

The genus *Dyera* is revised. Two species, *Dyera costulata* and *Dyera polyphylla*, are recognised. A key to the species is presented and descriptions given.

Introduction

This account of *Dyera* is the latest in a series of revisions of the genera of Apocynaceae for the forthcoming account of subfamilies Apocynoideae and Rauvolfioideae in Flora Malesiana. The species of *Dyera*, under the name *jelutong* or its spelling variants, are familiar to many people in western Malesia: *Dyera costulata* (Miq.) Hook.f. is a widespread forest tree which is sometimes also cultivated, and *Dyera polyphylla* (Miq.) Steenis is a common tree in peat swamp forests. Even though these species are reasonably well known, the purpose of this revision is to provide a key to and descriptions of these two species, clarify the nomenclatural issues and typify the names. Monachino (1946) provided a detailed discussion of the traditional and economic uses of *Dyera* and an extensive bibliography of the previous literature. He summarised the taxonomic information on the genus at that time but stated that his work was to be regarded as provisional. He did, however, provide a great deal of useful information on what was known on the species of *Dyera* up to 1946 including wood anatomy, commercial yields, silviculture and field observations. I have provided distribution maps in this work but, as Monachino indicates and I can confirm from my own observations, most of the trees are only rarely in flower and are, therefore, rarely collected. The distribution maps must be considered an indication of the range of distribution of the species rather than the precise localities in which they can be found.

Monachino (1946) and others have suggested that the distinction between the two species is not clear. Monachino stated: "I emphasize that it is highly dubious whether *D. lowii* [= *D. polyphylla*] merits specific separation from *D. costulata*." He does, however, maintain it, a fate that he does not accord the then often recognised *D. laxiflora*, considered by him and by me as a synonym of *D. costulata*. Although the two species recognised here are closely related, in my view their delimitation is not as difficult as has been hitherto suggested. I have found that the number of specimens that are not clearly assignable to one species or the other are very few and that the two

species differ in several quite distinct characters (see key). In addition, Monachino (1946) suggested that the distinction based on altitude is misleading as *D. costulata* is also found at the lower altitudes characteristic of *D. polyphylla*. However, the issue is not altitude *per se* but whether the habitat is peat swamp forest or not. This is a habitat largely confined to lower altitudes but not all low altitude forests are in peat swamps. *D. polyphylla* is found only in peat swamp forest and has not been collected above 30 m altitude, whereas *D. costulata* is found in a wider variety of forests and on different soils up to 1220 m altitude but at lower altitudes never in peat swamps.

Monachino (1946) provided a long bibliography for the literature on *Dyera*. Below I have cited the literature from 1946 or earlier only if it is directly concerned with the taxonomy of *Dyera* and the reader is directed to Monachino's work for further references.

Herbarium material was studied from the following herbaria: A, BKF, BM, E, GH, K, KEP, L, NY, P, SAN, SAR, SING, U, US (Holmgren *et al.*, 1990). All specimens cited have been seen unless otherwise stated. The dimensions given in the descriptions are for dried material except for the gynoecium and androecium characters which are for flowers rehydrated with water.

***Dyera* Hook.f.**

J. Linn. Soc. 19 (1882) 293; K. Schumann *in* Engler & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 139; Monachino, Lloydia 9 (1946) 182; Pichon, Mém. Mus. Nat. Hist. Nat. sér. 2, 27 (1948) 190.

Trees, often growing to enormous size; buttresses absent; white latex present in all plant parts. **Branchlets** usually strongly longitudinally ribbed when young, occasionally weakly so. **Leaves** verticillate; petioles relatively long with noticeable intrapetiolar stipules; blade often weakly crenulate at margin, glabrous. **Inflorescence** of umbelliform or paniculate cymes, lax or somewhat congested in upper parts. **Sepals** with colleters inside, connate at base, lobes often of different sizes. **Corolla** lobes overlapping to the left in bud; mature corolla platter-shaped, lobes oblong to lanceolate, more or less symmetrical, auriculate at the base on both sides, glabrous outside and inside. **Stamens** free from the pistil head, completely included in the corolla tube; filaments short and narrow; anthers lanceolate, base cordate, apex apiculate, sterile at apex, dehiscing laterally. **Disc** annular, inconspicuous, adnate to the ovary. **Ovary** apocarpous but carpels closely associated and appearing syncarpous, pubescent; ovules many per carpel; style and pistil head short. **Fruit** of paired, divergent follicles, these heavy and woody, dehiscing at maturity. **Seeds** elliptic, flattened, with a broadly membranous wing.

Key to the species of *Dyera*

- Trees without pneumatophore roots; leaf blades mostly obtuse to shortly acuminate at apex, only rarely rounded (and then not exclusively so), broadly cuneate to subcordate at base **1. *D. costulata***
- Trees with pneumatophore roots; leaf blades emarginate at apex, only rarely with some (but not all) leaves on a plant with rounded or apiculate apices, cuneate and decurrent onto petiole at base..... **2. *D. polyphylla***

1. *Dyera costulata* (Miq.) Hook.f. (Map 1)

Dyera costulata (Miq.) Hook.f., J. Linn. Soc. 19 (1882) 293; Hook.f., Fl. Brit. Ind. 3 (1882) 644; King & Gamble, J. As. Soc. Beng. 74, 2 (1907) 443; Winkler, Bot. Jahrb. 49 (1913) 372; Merrill, Bibl. Enum. Born. Pl. (1921) 498; Ridley, Fl. Mal. Pen. 2 (1923) 345; Kerr in Craib, Fl. Siam. Enum. 2 (1939) 441; Masamune, Enum. Phan. Born. (1942) 619; Monachino, Lloydia 9 (1946) 190; Browne, Forest Trees of Sarawak and Brunei (1955) 60; Backer & Bakhuizen f., Fl. Java 2 (1965) 227; Smythies, Common Sarawak Trees (1965) 21; Whitmore, Tree Fl. Mal. 2 (1973) 13; Cockburn, Trees Sabah 1 (1976) 19; Anderson, Checkl. Trees Sarawak (1980) 148; Whitmore & Tantra, Checkl. Sumatra (1986) 19; Ashton, Man. non-Dipt. Trees Sarawak (1988) 32; Corner, Wayside Trees Mal. ed. 3, 1 (1988) 154; Whitmore & Tantra, Checkl. Sulawesi (1989) 14; Whitmore, Tantra & Sutisna, Checkl. Kalimantan. (1990) 25; Kessler & Sidiyasa, Trees Balikpapan-Samarinda. (1994) 53; Turner, Gard. Bull. Sing. 47 (1997) 12; PROSEA 5, 2 (1995) 229; Coode *et al.* (eds.), Checkl. Pl. Brunei (1996) 26; Middleton in Argent *et al.*, Man. Non-Dipt. Trees Central Kalimantan 1 (1997) 83; Kochummen, Tree Fl. Pasoh For. (1997) 151; Middleton, Fl. Thailand 7(1) (1999) 36; PROSEA 18 (2000) 65. **Basionym:** *Alstonia costulata* Miq., Fl. Ind. Bat. Suppl. (1861) 556. **Type:** *Diepenhorst* HB 1114 Sumatra, Priaman (lecto U, designated here; iso K, L).

Synonyms: *Alstonia grandifolia* Miq., Fl. Ind. Bat. Suppl. (1861) 555. **Type:** *Teijsmann* HB 4044, Sumatra, Palembang (lecto U, designated here; iso K, L).

Alstonia eximia Miq., Fl. Ind. Bat. Suppl. (1861) 555. **Type:** *Teijsmann* HB 3358 Sumatra, Bangka, near Djebus (lecto U, designated here; iso L).

Dyera laxiflora Hook.f., Fl. Brit. Ind. 3 (1882) 644; King & Gamble, J. As. Soc. Beng. 74, 2 (1907) 444; Ridley, Fl. Mal. Pen. 2 (1923) 345. **Type:** *Cantley* 226 Singapore (lecto K, designated here).

Dyera sp. *indet.* Coode *et al.* (eds.), Checkl. Pl. Brunei (1996) 27.

Tree to 80 m high, to 3 m diameter, sometimes with somewhat exposed roots but not with knee-shaped pneumatophores. **Bark** dark grey, brown or black, smooth with

squarish scales; inner bark cream, pale grey or pale reddish; wood cream or white. **Twigs** 3.5–9 mm diameter, glabrous. **Leaves** in whorls of 4–8; stipules 3–6 mm long; petiole 2–6.2 cm long, glabrous; blade coriaceous to papery, obovate, oblong or elliptic, 5.5–42 x 1.8–14 cm, 1.6–4.3 times as long as wide, glabrous above and beneath, glaucous beneath or not; base subcordate to rounded (sometimes from a narrowed base), rarely cuneate, margin crenulate or weakly crenulate, apex short acuminate to rounded; midrib sunken to slightly raised above; secondary veins 12–24 pairs, at 45–80° from midrib, clearly distinguishable from tertiary venation, prominent or flat above, prominent beneath; tertiary venation reticulate or subscalariform, prominent above and beneath. **Inflorescences** arranged in whorls, 4–18 cm long, glabrous, many-flowered; peduncle 2.5–9.2 cm long; pedicels 1.5–6.5 mm long. **Sepals** ovate or orbicular, apex rounded to acute, 1–3 x 0.8–2 mm, 1–1.5 times as long as wide, ciliate or not, glabrous. **Corolla** white, yellowish green or pinkish yellow; tube 1.1–3 mm long, 0.3–0.6 times as long as lobes, glabrous inside and outside; lobes 3–9 x 1.2–2.3 mm, 1.7–4.4 times as long as wide, glabrous outside and inside. **Stamens** inserted at 0.5–0.6 mm from corolla base which is 0.2–0.36 of tube length; anthers 1.1–1.4 x 0.4–0.5 mm, 2.7–3 times as long as wide, exserted 0–0.88 mm from corolla throat. **Ovary** 0.3–0.6 mm long; style 0–0.2 mm long; pistil head 0.5–0.7 mm long. **Fruit** 18–40 cm long, 2.5–4 cm diameter. **Seed grains** c. 2.5 x 1.5 cm, c. 5 x 2 cm with wing.

Habitat and Ecology: In a range of evergreen forest types on brown or yellowish soil, at altitudes to 1200 m.

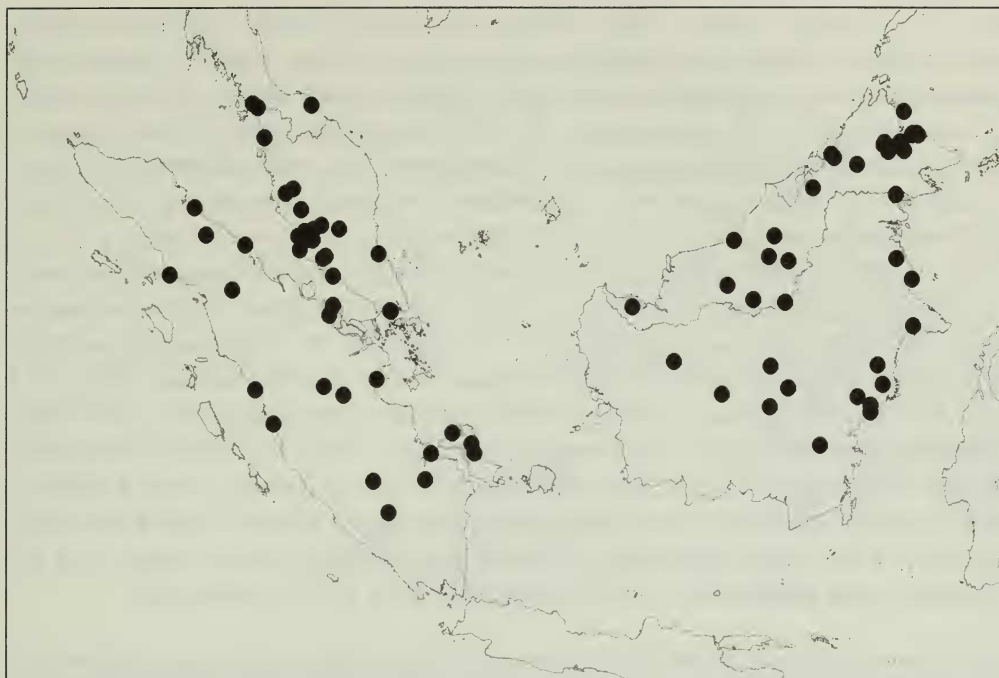
Distribution: Southern Thailand (6 collections), Sumatra (24 collections), Peninsular Malaysia (31 collections), Singapore (2 collections), and Borneo (Brunei, 2 collections; Kalimantan, 26 collections; Sabah, 32 collections; Sarawak, 10 collections).

Note: Specimens of *Dyera costulata* from Sumatra more often have a cuneate leaf base than those from other parts of its range, making it more difficult to distinguish herbarium material of the two species from Sumatra.

Monachino (1946) and a number of later authors following Monachino listed *Dyera costulata* as possibly occurring in Sulawesi. However, I have not seen any material from Sulawesi and doubt it occurs there. Kessler *et al.* (2002) do not include it in their checklist to the woody plants of Sulawesi. It is also absent from Java.

2. *Dyera polyphylla* (Miq.) Steenis (Map 2)

Dyera polyphylla (Miq.) Steenis, Blumea 14 (1967) 316; Anderson, Trees Peat Swamp Forests Sarawak (1972) 23; Cockburn, Trees Sabah 1 (1976) 20; Anderson, Checklist Trees Sarawak (1980) 148; Ashton, Man. non-Dipt. Trees Sarawak (1988) 32;



Map 1. Distribution of *Dyera costulata* (Miq.) Hook.f.

Whitmore, Tantra & Sutisna, Checkl. Kalimantan. (1990) 25; PROSEA 5.2 (1995) 230; Middleton in Argent *et al.*, Man. Non-Dipt. Trees Central Kalimantan. 1 (1997) 83. **Basionym:** *Alstonia polyphylla* Miq., Fl. Ind. Bat. Suppl. (1861) 556. **Type:** *Teijsmann HB 3212* Sumatra, Bangka, near Djebus (holo U; iso BO n.v., L).

Synonyms: *Dyera lowii* Hook.f., J. Linn. Soc. 19 (1882) 293; Merrill, Bibl. Enum. Born. Pl. (1921) 498; Masamune, Enum. Phan. Born. (1942) 619; Monachino, Lloydia 9 (1946) 194; Browne, For. Trees Sarawak & Brunei (1955) 63; Smythies, Common Sarawak Trees (1965) 21; Whitmore & Tantra, Checkl. Sumatra (1986) 19; Coode *et al.* (eds.), Checkl. Pl. Brunei (1996) 26. **Type:** *Beccari 3570* Sarawak (lecto K, designated here; iso FI n.v., P).

Dyera borneensis Baill., Bull. Soc. Linn. Paris 1 (1888) 751; Merrill, Bibl. Enum. Born. Pl. (1921) 498, Masamune, Enum. Phan. Born. (1942) 619. **Type:** *Beccari 3570* Sarawak (holo P).

Tree to 60 m tall, to 2 m diameter; knee-shaped pneumatophore roots present, these chocolate-brown and with paler lenticels. **Bark** chocolate-brown or greyish brown with corky paler lenticels and horizontal ridges; inner bark cream; wood cream. **Twigs** 11–14 mm diameter, glabrous. **Leaves** in whorls of 6–8; stipules 4.5–5 mm long; petiole 2.1–4.5 cm long; blade coriaceous or subcoriaceous, obovate, 4–24 x 2.3–10.7

cm, 1.7–2.9 times as long as wide, glabrous above and beneath, glaucous beneath, base cuneate, margin not crenulate or only weakly so, apex retuse or, more rarely, rounded, obtuse or apiculate; midrib flat or slightly raised above; secondary veins 17–32 pairs with 3–12 mm spacing, $65\text{--}75^\circ$ from midrib, more or less straight to curved ascending, slightly prominent or flat above, not prominent beneath; tertiary venation reticulate to somewhat scalariform, not prominent above or beneath. **Inflorescences** arranged in whorls, 8.5–14 cm long, glabrous; peduncle 4–11 cm long, sometimes with reduced leaves at apex; pedicels 1.5–3 mm long. **Sepals** ovate to orbicular, apex rounded or obtuse, 1–1.4 x 1–1.4 mm, 0.9–1.2 times as long as wide, not ciliate, glabrous. **Corolla** tube 1–3 mm long, 0.35–1 times as long as lobes, glabrous or, slightly pubescent beneath stamens inside, glabrous outside; lobes 1.8–4 x 1–1.7 mm, 1.4–3 times as long as wide, glabrous outside and inside, not ciliate. **Stamens** inserted at 0.5–0.6 mm from corolla base which is 0.4–0.43 of the tube length; filaments c. 0.3 mm long; anthers 0.8–1.5 x 0.3–0.4 mm, 2.7–3.8 times as long as wide, exerted 0.1–0.8 mm from corolla throat. **Ovary** 0.5–0.9 mm long; style 0–0.1 mm long; pistil head c. 0.5 mm long. **Fruit** 22–30 cm long, 1.8–4 cm diameter. **Seed grains** 1.8–2 x 0.8–1.2 mm, 3.7–4.5 x 1.2–1.5 with wing.

Habitat and Ecology: Known only from peat swamp forest, often in association with *Alstonia pneumatophora* Backer ex Den Berger. Both species have pneumatophore roots that can easily be distinguished in the field by the chocolate-brown bark with corky paler lenticels and horizontal ridges of *Dyera polyphylla* and the grey bark with non-corky horizontal lenticels of *Alstonia pneumatophora* even when the connection to the parent tree is not obvious.

Distribution: Sumatra (10 collections) and Borneo (Brunei, 5 collections; Kalimantan, 13 collections; Sabah, 6 collections; Sarawak 10 collections).

Notes: Flowering material of *Dyera polyphylla* is extremely scarce and, therefore, the description given for flowers above is likely to be expanded once more material can be collected. The initial findings suggest that there is a complete overlap in flower dimensions for the two species of *Dyera*. However, the scarcity of flowers for *D. polyphylla* makes it more difficult to be conclusive when comparing the flower characters in the genus. I was unable to confirm the differences in sepals and anthers tentatively suggested by Monachino (1946). However, the two species are very easily separable on vegetative characters.

In the publication of the new combination of *Dyera polyphylla* by Van Steenis, the type specimen was given as “*HB 2312* in U, isotype L, BO”. However, *HB 2312* is a typographical error for *HB 3212*. I have not seen the isotype specimen in Bogor.

Dyera lowii was originally described by J.D. Hooker with a number of syntypes, *Low s.n.*, *Beccari 3570* and *Lobb s.n.*, and although it was clearly named in



Map 2. Distribution of *Dyera polyphylla* (Miq.) Steenis

honour of Sir Hugh Low and therefore it would seem appropriate to lectotypify his collection the only specimen I have seen, from Kew, is sterile. The Beccari collection mentioned without number in the protologue is *Beccari 3570*. The Kew specimen of this collection is fertile and given that there are also duplicates would much better serve as the lectotype. The Paris duplicate of *Beccari 3570* is also the holotype of *Dyera borneensis* Baill. This name is legitimate as *Dyera lowii* contained a number of syntypes and was not lectotypified before the publication of *Dyera borneensis*. The holotype of *D. borneensis* in Paris can therefore simultaneously serve as an isolectotype of *D. lowii*.

References

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Acknowledgements

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Specimens examined

Only the specimens with a clear collector and collector number are listed. (1) = *Dyera costulata*; (2) = *Dyera polyphylla*.

Aban & Toshifumi SAN 60108 (1), 95171 (1); Abdullah BRUN 16911 (2); Abu 1772 (1), 2258 (1), 3328 (1); Agama 4414 (1), 38790 (1); Ahmad 10816 (2), 94494 (1), 3885 (1); Allen & Kadim 468 (1); Aloysius & Dewol SAN 73963 (1); Ambri & Arifin W312 (1), W513 (1); Amiruddin 47 (1); Ampuria SAN 32633 (1); Anderson S 9730 (2), S 28738 (1); Anggana bb 37128 (2); Asah anak Unyong BRUN 3152 (1); Awang 47831 (1); Awang Enjah S 58063 (2).

Beccari 3570 (2); Binideh SAN 58586 (1); Boschproefstation bb. 804 (1), bb 7334 (2), bb 10553 (2), bb 15222 (1), bb 35690 (1), bb 36151 (1); Bujang 30496 (2), 30549 (2); Burley *et al.* 1408 (1).

Cantley 226 (1); Carroll 546 (2); Castillo & Valderrama 10 (1); Castro A 820 (1); Cheng FRI 27548 (1), FRI 27908 (1); J. Clemens & M.S. Clemens 502 (1), 21502 (1); Clements SAN 138208 (1); Cuadra A 1296 (2).

Daris 53560 (1); De Hulster 6 (2); Diepenhorst HB 1114 (1), Dumas 1541 (1); Edwards 3894 (2); Edwards 36671 (2), BNB 3893 (2); Egon A 0613 (2); Endert 37E (1), 479 (1), 509 (1); Enggoh 7252 (1).

Fischer 754 (1); Flemmich 29323 (1); Foxworthy 4906 (1).

Gadoh KLU. 1355 (1); Garai 2049 (1); Grashoff 56 (2), 677 (2), 784 (1).

Hamid 971 (1), 4917 (1), 5499 (1), SF 24216 (1); Haviland 2170 (2); Haviland & C. Hose 3495 (2); Heyne 765 (2); Holttum SFN 9904 (1).

Ibrahim 14382 (1).

Jawa S 65627 (1).

Kadir A 3509 (1), KEP 55431 (1); Kawasan SAN 79623 (1); Keith A 7137 (1); Kerr 13909 (1); Kochummen KEP 76696 (1); Kostermans 107A (1), 4171 (1), 10164 (1), bb 34207 (1), bb 35355 (1); Kunstler 4689 (1).

L.T.S. SAN 64858 (1); Lai *et al.* S 68565 (1); Lakshnakara 353 (1); Lasan SAN 102531 (1); Leeuwenberg & Rudjiman 13075 (1); Lobb s.n. (2); Low s.n. (2).

Madani SAN 36768 (1); Maingayi 1097 (1); Mat Yatim 26173 (1); Meijer & Wood SAN 130247 (2); Van Meurs s.n. (2); Mikil SAN 28098 (1), SAN 31802 (1); Mohamad 17169 (1); Mujin & Tuyok SAN 78716 (1).

Native Collector 804 (2); Neth. Ind. For. Service bb 10589 (2); bb 6315 (1), bb 9847 (2), bb 10644 (2), bb 12936 (1), bb 15221 (1), bb 16255 (1), bb 16265 (1), bb 16280 (1), bb 16400 (1), bb 16407 (1), bb 16742 (1), bb 16962 (1), bb 17952 (1), bb 18112 (2), bb 18246 (1), bb 18400 (2), bb 19973 (2), bb 21178 (1), bb 21212 (1), bb 21263 (2), bb 23480 (1), bb 23929 (2), bb 24663 (1), bb 27601 (1), bb 27744 (1), bb 28079 (2), bb 28122 (1), bb 28446 (1), bb 28564 (2), bb 29133 (2), bb 29145 (2), bb 29444 (2), bb 29993 (1), bb 30122 (1), bb 31601 (1), bb 31754 (1), bb 31997 (1), bb 32283 (2); Ngah 21954 (1); Nicholson 22297 (2); van Niel 3966 (2); Nooteboom 5033 (1); Nur SFN 35475 (1).

Omar 8855 (1); Onggib 7137 (1); Orolfo 4786 (1); Othman Ismawi *et al.* S 56417 (1).

Paie S 37571 (1); Pickles S 3565 (1); Pilis Malahim SAN 95257 (1).

Raji 55439 (1); Ramos 1912 (1); Richards 1308 (1); Ridley 62 (1), 4922 (1), 5656 (1); Ridsdale PBU195 (1).

Sadau SAN 49557 (1); Saikeh SAN 72224 (1); Sharin 35177 (1); Sinclair 6335 (1); Sitam 603 (2); Smitinand & Williams 17003 (1), 17004 (1), 17213 (1), 17214 (1); Soewanda bb. 32655 (2), bb. 36716 (1); Symington C.F.22122 (1).

Tahja 7 (2); Talib Bidin SAN 84691 (1), SAN 84751 (1), SAN 84752 (1); Talip SAN 55688 (1); Tan SAN A 0617 (2); Tantra 75 (2), bb 35858 (2); Tarmiji SAN 73884 (1); Tarmiji & M. Alexius SAN 79883 (1); Tarmiji & A. Tasan SAN 82940 (1); Teijsmann HB 3212 (2), HB 3358 (1), HB 4044 (1).

Watson 39633 (2); Winkler 2435 (1); Wong WKM 252 (1); Wyatt-Smith KEP 79326 (2).

Yakim 1988 (1).

